

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A novel photovoltaic solar cell comprising:
at least one absorber layer, and
at least one doped window layer having at least two p-type sub-window layers ~~sub-~~
~~layers~~, wherein ~~the~~ a first p-type sub-window layer is adjacent the absorber layer and forms a
desirable junction with the absorber layer and wherein ~~the~~ a second p-type sub-window layer
is adjacent the first p-type sub-window layer and has high optical transmission;

wherein the absorber layer ~~of the photovoltaic cell~~ comprises ~~a thin film silicon (tf-Si) alloy based solar cell including~~ at least one of amorphous silicon (a-Si:H) ~~based solar cell~~, amorphous silicon germanium (a-Si_(1-x)Ge_x:H) ~~based solar cell~~, nanocrystalline silicon (nc-Si:H) ~~based solar cell~~, microcrystalline silicon (μc-Si:H) ~~based solar~~, polycrystalline silicon (poly-Si:H) ~~based solar cell~~, or other combinations and mixtures thereof;

the first and second p-type sub-window ~~p-type~~ layers each being comprised of ~~one or more of thin film silicon based materials including at least one of amorphous silicon, polycrystalline silicon, nanocrystalline silicon, microcrystalline silicon, polycrystalline silicon (poly-Si:H), or other combinations and mixtures thereof;~~

wherein the second p-type sub-window ~~p-type~~ layer has a transparency and a thickness that are both greater than the transparency and the thickness of the first p-type sub-window ~~p-type~~ layer, and

~~wherein there is a minimal mismatch between the bandgap of the first sub-window p-type layer and the bandgap of the absorber layer that is adjacent to the first sub-window p-layer.~~

2. - 10. Cancelled

11. (Original) The solar cell of claim 1, further comprising a substrate selected from at least one of: glass, metal or plastic.

12. (Currently Amended) The solar cell of claim 11, further comprising a transparent conductive oxide layer adjacent the second p-type sub-window-layer.

13. Cancelled

14. (Currently Amended) The solar cell of claim 1, further comprising a buffer semi-conductor layer between the absorber-layer and the first p-type sub-window layer.

15. - 74. Cancelled

75. (Currently Amended) The solar cell of claim 1, the first p-type sub-window layer being formed by deposition at a first temperature, and the second p-type sub-window layer being formed by deposition at a second temperature that is lower than the first temperature.

76. (Currently Amended) The solar cell of claim 1, wherein the first p-type sub-window layer sub p-layer adjacent to the i layer being formed after the i layer is formed from the same thin film silicon based material as the second p-type sub-window layer.

77. (Currently Amended) A novel photovoltaic solar cell comprising:
a substrate;

at least one absorber layer, and

at least one doped window layer having at least two ~~sub-layers~~ sub-window layers, wherein the first sub-window layer is adjacent the absorber layer and forms a desirable junction with the absorber layer and wherein the second sub-window layer is adjacent the first sub-window layer and has high optical transmission;

wherein the absorber layer ~~of the photovoltaic cell comprises a thin film silicon (tf-Si) alloy based solar cell including at least one of amorphous silicon (a-Si:H) based solar cell, amorphous silicon germanium (a-Si_(1-x)Ge_x:H) based solar cell, nanocrystalline silicon (nc-Si:H) based solar cell, microcrystalline silicon (μ c-Si:H) based solar, polycrystalline silicon (poly-Si:H) based solar cell, or other combinations and mixtures thereof;~~

the first and second sub-window p-type layers each being comprised of ~~a one or more of thin film silicon based materials including at least one of amorphous silicon,~~

~~protocrystalline silicon, nanocrystalline silicon, microcrystalline silicon, polycrystalline silicon (poly-Si:H), or other combinations and mixtures thereof;~~

wherein the second sub-window p-type layer has a transparency greater than the first sub-window p-type layer, and ~~wherein there~~ wherein there is a minimal mismatch between the bandgap of the first sub-window p-type layer and the bandgap of the absorber layer that is adjacent to the first sub-window p-layer; and,

wherein the substrate comprises a stainless steel metal, the first and second p-type sub-window layers comprise a-Si:H, the absorber layer comprises a-SiGe:H, and the n-layer comprises a-Si:H.

78. (Currently Amended) The solar cell of claim 77, the first p-type sub-window layer being formed by deposition at a first temperature, and the second p-type sub-window being formed by deposition at a second temperature that is lower than the first temperature.

79. (New) A photovoltaic cell comprising:

an absorber layer having a structure formed from at least one of amorphous silicon (a-Si:H), amorphous silicon germanium ($\text{a-Si}_{(1-x)}\text{Ge}_x\text{:H}$), nanocrystalline silicon (nc-Si:H), microcrystalline silicon ($\mu\text{c-Si:H}$), and polycrystalline silicon (poly-Si:H);

a first p-type sub-window layer having a first thickness and being deposited onto the absorber layer at a first processing temperature such that the first p-type layer forms a desirable junction with the absorber layer; and

a second p-type sub-window layer having a second thickness wherein the second thickness is greater than the first thickness of the first p-type sub-window layer, the second p-type sub-window layer being deposited onto the first p-type sub-window layer at a second processing temperature that is lower than the first processing temperature of the first p-type sub-window layer such that the second p-type sub-window exhibits a higher transparency to incoming solar radiation than the first p-type sub-window layer.

80. (New) The photovoltaic cell of claim 79 wherein the first thickness is in the range of about 0.001 microns to about 0.004 microns and the second thickness is in the range of about 0.005 microns to about 0.02 microns.

81. (New) The photovoltaic cell of claim 79 wherein the first processing temperature is about 140 °C and the second processing temperature is about 70 °C.

82. (New) The photovoltaic cell of claim 79 wherein that the first p-type layer forms a desirable junction with the absorber layer having a current-voltage relationship where the rate of change of the current-voltage relationship is one of a constant or increasing rate of change and the second p-type sub-window exhibits a higher transparency to incoming solar radiation than the first p-type sub-window layer.

83. (New) A photovoltaic cell comprising:
 an absorber layer having a structure formed from at least one of amorphous silicon (a-Si:H), amorphous silicon germanium (a-Si_(1-x)Ge_x:H), nanocrystalline silicon (nc-Si:H), microcrystalline silicon (μc-Si:H), and polycrystalline silicon (poly-Si:H);
 a first p-type sub-window layer having a structure formed from a nanocrystalline silicon material and having a first thickness in the range of about 0.001 microns to about 0.004 microns and being deposited onto the absorber layer at about 140 °C such that the first p-type layer forms a desirable junction with the absorber layer; and
 a second p-type sub-window layer having a structure formed from the same material as the first p-type sub-window layer and having a second thickness in the range of about 0.005 microns to about 0.02 microns and being deposited onto the first p-type sub-window layer at about 70 °C such that the second p-type sub-window exhibits a higher transparency to incoming solar radiation than the first p-type sub-window layer.

84. (New) The photovoltaic cell of claim 83 wherein the desirable junction formed between the first p-type layer and the absorber layer has a current-voltage relationship where the rate of change of the current-voltage relationship is one of a constant or increasing rate of change.

85. (New) The photovoltaic cell of claim 84 wherein the rate of change of the current-voltage relationship of the first layer exhibits no rollover in the voltage range around the open circuit voltage.

86. (New) The photovoltaic cell of claim 1 wherein the absorber layer consists of essentially amorphous silicon germanium ($\text{a-Si}_{(1-x)}\text{Ge}_x\text{:H}$), and the first and second p-type sub-window layers consist essentially of nanocrystalline silicon (p-nc-Si).

87. (New) The photovoltaic cell of claim 77 wherein the absorber layer consists of essentially amorphous silicon germanium ($\text{a-Si}_{(1-x)}\text{Ge}_x\text{:H}$), and the first and second p-type sub-window layers consist essentially of nanocrystalline silicon (p-nc-Si).

88. (New) The photovoltaic cell of claim 79 wherein the absorber layer consists of essentially amorphous silicon germanium ($\text{a-Si}_{(1-x)}\text{Ge}_x\text{:H}$), and the first and second p-type sub-window layers consist essentially of nanocrystalline silicon (p-nc-Si).

89. (New) The photovoltaic cell of claim 83 wherein the absorber layer consists of essentially amorphous silicon germanium ($\text{a-Si}_{(1-x)}\text{Ge}_x\text{:H}$), and the first and second p-type sub-window layers consist essentially of nanocrystalline silicon (p-nc-Si).